Consider all your dairy's nutritional effects on reproduction

R. Tom Bass for *Progressive Dairyman*

Sound reproductive programs are one of the keys to dairy profitability. Perhaps no other area of dairy management has as many influencing factors as reproduction. A herd's incidence and severity of metabolic and infectious disease, lameness and heat stress, the level of milk production, heat detection accuracy and efficiency, conception rate and a variety of other cow, management and nutritional considerations, all can and do influence reproductive success to varying degrees. The intent of this article is to focus on some nutritional effects, but also recognize that many, if not all, of these are likely of secondary importance to one or several of the other factors listed above.

Energy status and body condition

Negative energy balance is arguably the biggest nutritional influence on reproductive performance in dairy cattle. Body condition score (BCS), using a 1 to 5 scale, is probably the most practical means of assessing a cow's energy stores, but it does not allow you to determine whether she is gaining or losing condition unless assessed repeatedly over time. However, even when used as a "snapshot" of current energy status, it correlates reasonably well with potential reproductive performance. The extent and rate of condition loss, as well as current BCS, are all important considerations. Several studies have shown that thin cows and/or cows that lose excessive body condition (1 point or more of BCS) are less fertile. Also, more rapid loss of a given amount of condition commonly results in poorer reproductive performance. Even subclinical ketosis, a prevalent condition on many dairies, can impair future reproductive success, with a recent New York study finding a 14 to 18 percent reduction in pregnancy rates in affected cows.

What's normal BCS loss for fresh cows? A multi-year Wisconsin study, involving over 9,500 cows and almost 17,600 lactations in 153 herds, concluded that cows typically calved at a BCS of approximately 3.25 out of 5 and lost half a BCS after calving, with the lowest BCS typically observed around 50 days in milk (DIM). This study also determined that a BCS of <2.5 occurring between 30 and 200 DIM was a significant risk factor for reduced reproductive performance. Goals for BCS management include drying cows off at a BCS of 3.0-3.25, maintenance of that BCS through the dry period until calving and a loss of 0.5 BCS after calving. To achieve this, focus on management-related and nutrition-related considerations that encourage high dry matter intake through the transition period (both pre-fresh and post-fresh). Important considerations include proper dry and fresh cow management (adequate feedbunk space, minimal group/social changes and good cow comfort), as well as a low-energy formulation strategy for dry cow rations. For transition cows, boosting ration energy density via the inclusion of more fat and/or starch

should be a secondary consideration to making other management-related changes that facilitate additional dry matter intake.

Fats and fatty acids

Over the past 15 to 20 years, we've learned and further reinforced the concept that fat can no longer simply be viewed as an energy source in dairy rations. Different fatty acids can exert different biological effects, from influences on milkfat synthesis to immune function and reproductive efficiency. A number of studies have demonstrated improved reproductive function in response to supplemental fat. Most of the more recent research yielding positive results have been associated with relatively high feeding rates of a fat supplement – 1.5 percent of the ration dry matter or higher. Rations currently fed on most commercial dairies typically do not include supplemental fat at these levels. Also, some studies have reported negative effects to supplemental fat feeding, so as with virtually any feed additive or ration strategy, there is no guarantee of a positive response. Objectively evaluating the response is often difficult because of the multitude of confounding factors always present and on-farm changes that inevitably occur.

The majority of the recent fatty acid research as related to improved reproductive function has focused on linolenic (omega-3) and linoleic (omega-6) supplementation. Specific reproductive responses appear to vary somewhat with the fatty acid fed, and as mentioned earlier, the positive responses have been associated with high inclusion rates of the fatty acid supplement. Linolenic acid has improved pregnancy rates in some, but not all, studies and has also been reported to reduce pregnancy losses, at least in part through its ability to reduce uterine production of prostaglandin F2α. Linoleic acid has improved first-service conception rates and is believed to exert its benefits through hormonal modulation and improved immune function.

Protein

Excessive ration protein content, and/or elevated milk urea nitrogen (MUN) concentrations, has been incriminated as detrimental to fertility in some studies. However, this has not been a consistent finding. Elevated MUNs are most likely to be problematic in the very early stages of pregnancy and, perhaps, when considered in an additive manner with other

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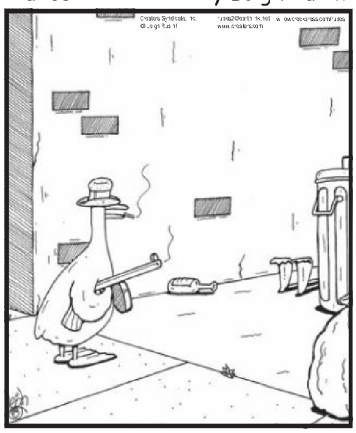

"I hope this clears up any misunderstanding, pal. What's good for

concurrent anti-fertility factors such as heat stress.

Elevated MUNs are sometimes viewed as a proxy for excessive ration protein concentrations; they are better described as an indication of a protein-carbohydrate mismatch. With advances in ration-modeling programs, environmental pressures and rising feed costs, gross overages in ration protein content are not nearly as prevalent as they were 10 or 15 years ago. At least with respect to typical Northeast and Midwest dairy rations, elevated MUNs appear to be more commonly associated with a relative lack of carbohydrate fermentability rather than too much protein. Remember that some variation in bulk tank MUN values is normal and to be expected. Many dairies that achieve and maintain good production and reproduction target bulk tank MUN values of 10 to 13 mg per dL.

Minerals and vitamins

Numerous studies have reported numerical or statistical improvements in reproductive function (primarily pregnancy rate) in association with feeding chelated/complexed (organic) forms of zinc, manganese, copper and cobalt. Organic selenium (Se-yeast) has shown very limited benefits to on-farm measures of reproductive performance. One study involving California and Florida dairies reported improved uterine health and improved second-service pregnancy rates in Florida herds in association with feeding organic Se.

The question of phosphorus (P) supplementation as a means of improving herd reproductive performance still comes up occasionally, but less and less over time. There is no valid scientific data to support feeding over 0.38 to 0.39 percent ration P (100 percent DM basis). Many herds have fed 0.32 to 0.35 percent P for multiple years, all the while maintaining good to excellent reproductive performance and milk production.

Beyond the immune function effects of vitamins A and E (E in particular), and the potential for improved uterine health, there is little vitamin-related data in support of improved reproductive performance. Beta-carotene (vitamin A precursor) has been associated with a few reports of improved fertility, but the overall body of data is equivocal.

Feeding rumen-protected choline through the transition period has been associated with numerical improvements in pregnancy rate in some trials but, to the author's knowledge, there has been no reported statistical improvement in the peer-reviewed scientific literature.

Conclusion

Achieving good reproductive performance requires consistent, successful integration of and attention to a large number of management-related, cow-related and nutrition-related factors. Nutrition is rarely the sole cause of reproductive problems and rarely, if ever, will it be the entire solution. Sound nutrition is certainly important to milk production, herd health and reproduction, but viewing it as a cure-all is likely to lead to disappointment. **PD**

References omitted due to space but are available upon request.

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